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Short Communication

The rare siphonophore *Rhizophysa eysenhardtii* Gegenbaur, 1859 (Hydrozoa, Siphonophora, Cystonectae) from False Bay, South Africa

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Abstract

From June to September 2022, five colonies of the rare hydrozoan siphonophore *Rhizophysa eysenhardtii* were observed for the first time near the surface in False Bay, South Africa. The two colonies in June/July were small with all tentacles contracted, while the September colonies were larger, the largest up to 0.8 m long (in video), with most of its tentacles extended for feeding. In this species, tentacles are typically pink and each arises from the proximal end of a gastrozooid, which engulfs and digests the prey. Fish larvae were noted in the gastrozooids and counted and a chaetognath was observed stuck to one of the tentacles. The pneumatophore was prominent in all specimens and gonodendra bearing sexual gonophores were visible between the gastrozooids of the larger specimens.

Key words: Benguela ecosystem, cystonect, diet, Great African Seaforest, *in situ* observation, photo and video identification

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Introduction

Rhizophysa is a cystonect siphonophore, with a float, or pneumatophore, at the apex of the stem, but no nectophores (swimming bells). There are only five currently recognised cystonect species, which are distributed between two families: the Physaliidae and the Rhizophysidae (Dunn et al. 2005, fig. 6). The Physaliidae is monotypic for the Portuguese Man of War, *Physalia physalis*, which has a large float, but no stem. The Rhizophysidae have a smaller float and a long stem which bears repeated cormidial units each comprising a gastrozooid or feeding zooid, with tentacle and, when mature, a gonodendron or reproductive zooid. This family includes two genera: the bathypelagic *Bathyphysa* and the mostly epipelagic *Rhizophysa*, which morphologically differ only in the presence or absence of ptera or wings on the gastrozooids. Ptera are present in the gastrozooids of *Bathyphysa* species (Mapstone et al. 2021) and are thought to increase the surface area of the colony and slow down its sinking rate (Biggs and Harbison 1976). In *Rhizophysa*, sinking is slowed by constant contraction and relaxation of the stem to maintain its position in the water column (Totton 1965; Munro et al. 2018) and colonies have been observed peacefully drifting

and writhing about at the surface in a calm sea, while their tentacles hang down below like long fishing lines to catch prey (Gegenbaur 1853).

This study reports the first occurrence of *Rhizophysa eysenhardtii* Gegenbaur, 1859 from False Bay, Cape Town, South Africa from snorkelling observations at shallow near shore depths of 1–3 m.

Materials and methods

Elongate cystonect specimens were observed swimming near the surface (Table 1) by JL on the western side of False Bay around Simon's Town (34°12.6'S, 18°28.05'E), South Africa: one on 19 and two more on 25 September 2022. Multiple videos and numerous still images were taken *in situ* and sent to GM for more detailed examination. Images were taken adjacent to a head of the Bamboo kelp *Ecklonia maxima* using an Olympus TG6 with FCON-T01 Fish-eye converter. Natural sunlight was complemented by using a BigBlue VLT4200P video light. Colony length was estimated, based on the distance of the specimen from the camera and varied between more than 0.4–0.5 m to 0.8 m, depending on whether the colony was expanded or contracted. The gas-filled space in the gas chamber of the pneumatophore was particularly prominent in all images due to the reflection of light rays from it.

Using an Olympus TG6 with natural sunlight, two more long-stemmed cystonects were also imaged by Catherine Corder: one near the water surface at Long Beach, Simon's Town (34°11.20'S, 18°25.59'E) on 27 June 2022 and one at Smitswinkel Bay (34°16.00'S, 18°28.01'E) and sent to JL on 7 October 2023. Both were also identified as a rhizophysid.

Using the available images, we counted the number of caught fish larvae per colony by counting the eye-pairs that were visible inside the gastrozooids.

Glossary of terminology used in this paper:

Cormidial unit	serially repeated (iterative) group of zooids on the main stem of siphonophores, each including, in cystonects, a gastrozooid and one or more gonophores.
Gastrozooid	asexual feeding zooid in a cormidium, with tentacle arising from the proximal end.
Gonophore	sexual medusoid zooid arising from a branched complex called a gonodendron; each gonophore releases gametes of one sex only.
Hypocystic cavity	surrounds the pneumatosaccus of the pneumatophore.
Nectophore	asexual swimming bell.
Pneumatosaccus	gas bladder within the pneumatophore.
Pneumatophore	anterior gas-filled float.
Tentillum	side-branch of a tentacle bearing nematocysts (stinging cells).

Results

Two species are referred to the genus *Rhizophysa*: *R. filiformis* Forskal, 1775 and *R. eysenhardtii* Gegenbaur, 1859. These are distinguished mainly on differences between the side branches (tentilla) of their tentacles. In *R. filiformis*, the side branches terminate in swollen tips where the nematocysts for prey capture

occur (Totton 1965), whereas in *R. eysenhardtii*, the side branches lack swollen tips and, instead, the nematocysts are distributed along the whole length of the side branch, as well shown by Kawamura (1910, fig. 5c). There are also specific differences in the overall colour of the colony (Pugh 2019) and in the maximum size attained by the pneumatophore (Totton 1965).

The larger specimens imaged in False Bay (specimens 3–5, Table 1) had only simple side branches (tentilla) on the tentacles and, in those specimens with contracted tentacles, the tentacles were pink (Fig. 1). They were therefore concluded to be *R. eysenhardtii*. Specimen 1, for which we only had a picture with tentacles contracted, showed the same pink colouration (Fig. 2). Specimen 2 was small, contracted, with no clear visible colour and also photographed in a rock pool, so the identification of this specimen was based on coincidence of timing and event with specimen 1. The length of the pneumatophore of specimen 5 was estimated at ca.13 mm (Fig. 1B). The *Rhizophysa eysenhardtii* colonies described in this paper varied in colour from an overall rose in the small specimens (Fig. 2), to more translucent throughout, with pink tentacles and a yellow stem in the large specimen (Fig. 1).

The specimens had fed on fish larvae of unknown identity. Per colony, the number of gastrozooids containing captured fish larvae ranged from 0 to 8 (see Table 1). Furthermore, the largest Specimen 5 had captured a fish larva, as well as an unknown chaetognath (Phylum Chaetognatha), in its tentacles and both were not yet ingested by the gastrozooids.

Discussion

Two species in the genus *Rhizophysa* are currently known. Based on shape of the tentilla of the tentacles and on the colour, we identified the specimens presented in this paper as *R. eysenhardtii*. Our observations add biological information to a rarely documented siphonophore, which also presents a new record of the species for the location of False Bay, South Africa. Although probably common and potentially playing important ecological roles in the pelagic zones, published accounts of rhizophysids remain limited and, therefore, add valuable knowledge on the species' biology and distribution. Totton (1965, p.40) notes that "None of the Rhizophysidae commonly come into the hands of systematists, though the hands of fishermen suffer from their stings, since their tentacles adhere to cordage and nets by their nematocysts. No doubt these animals are abundant in deep water".

Table 1. Occurrence events of *Rhizophysa eysenhardtii* on the western shore of False Bay, Cape Town, South Africa.

Specimen	Size	Date	Remarks	Captured fish larvae (No. of gastrozooids)	Location	GPS	Photographer
1	0.1 m, contracted	27 Jun 2022	surface	8 (11)	Long Beach, Simon's Town	34°11.20'S, 18°25.59'E	C. Corder
2	0.05 m, contracted	05 Jul 2022	rock pool	0 (4)	Smitswinkel Bay	34°16.00'S, 18°28.01'E	C. Corder
3	0.6 m, extended	19 Sep 2022	surface to 2 m depth	6 (7)	A-Frame, Simon's Town	34°12.46'S, 18°27.74'E	J. Landschoff
4	0.4 m, extended	25 Sep 2022	1, 2 m depth	2 (9)	A-Frame, Simon's Town	34°12.46'S, 18°27.74'E	J. Landschoff
5	0.8 m, extended	25 Sep 2022	surface to 3 m depth	8 (19) + 1 fish and 1 chaetognath in tentacle	A-Frame, Simon's Town	34°12.46'S, 18°27.74'E	J. Landschoff

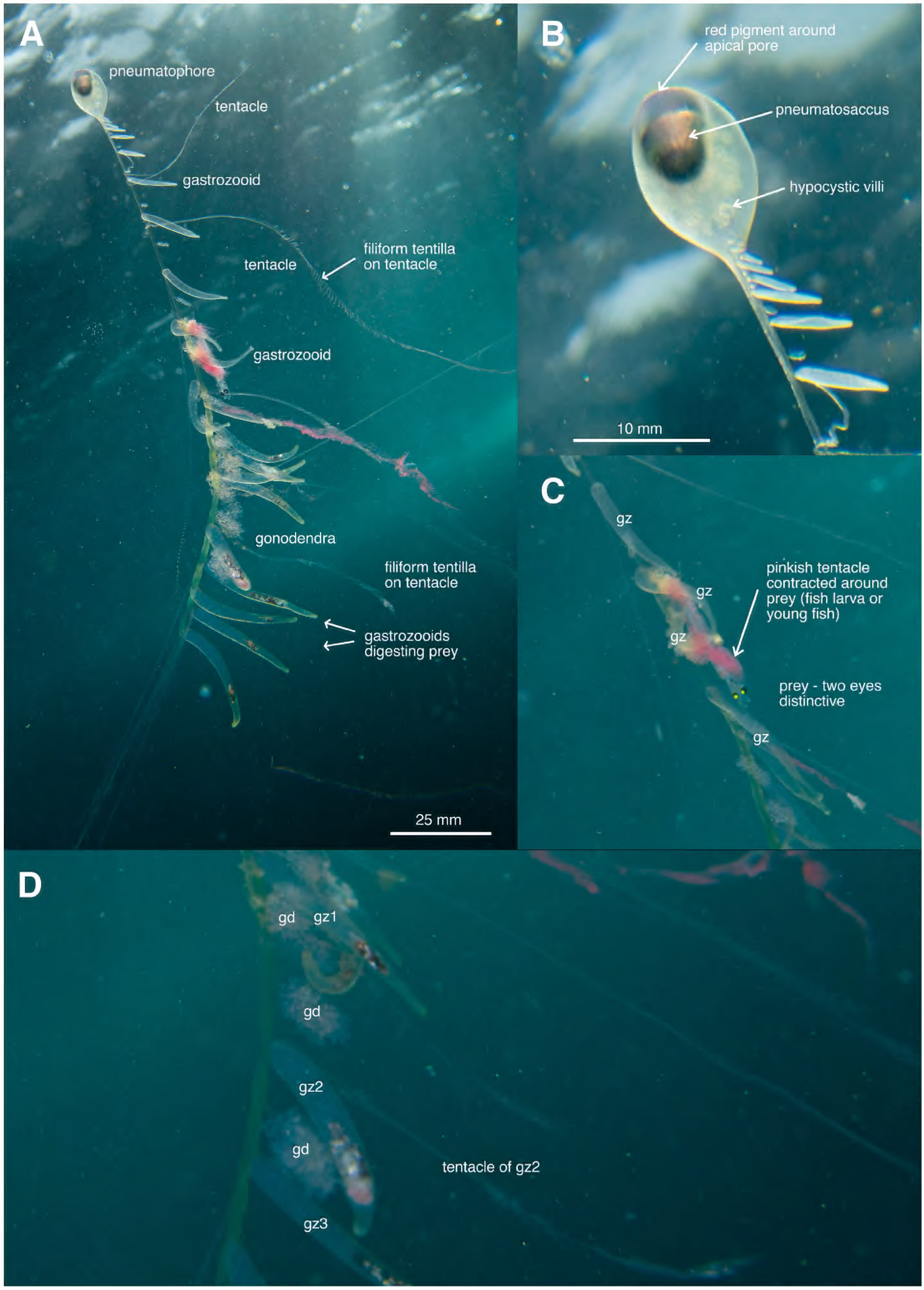

Figure 1. *Rhizophysa eysenhardtii* in shallow waters of False Bay, South Africa **A** whole colony **B** components of the pneumatophore **C** detail showing prey in contracted tentacle **D** detail showing three gonodendra (gz1–3) and nearby gastrozooids (gz – gastrozooid, gd – gonodendron). Pictures Jannes Landschoff, Sea Change Project.

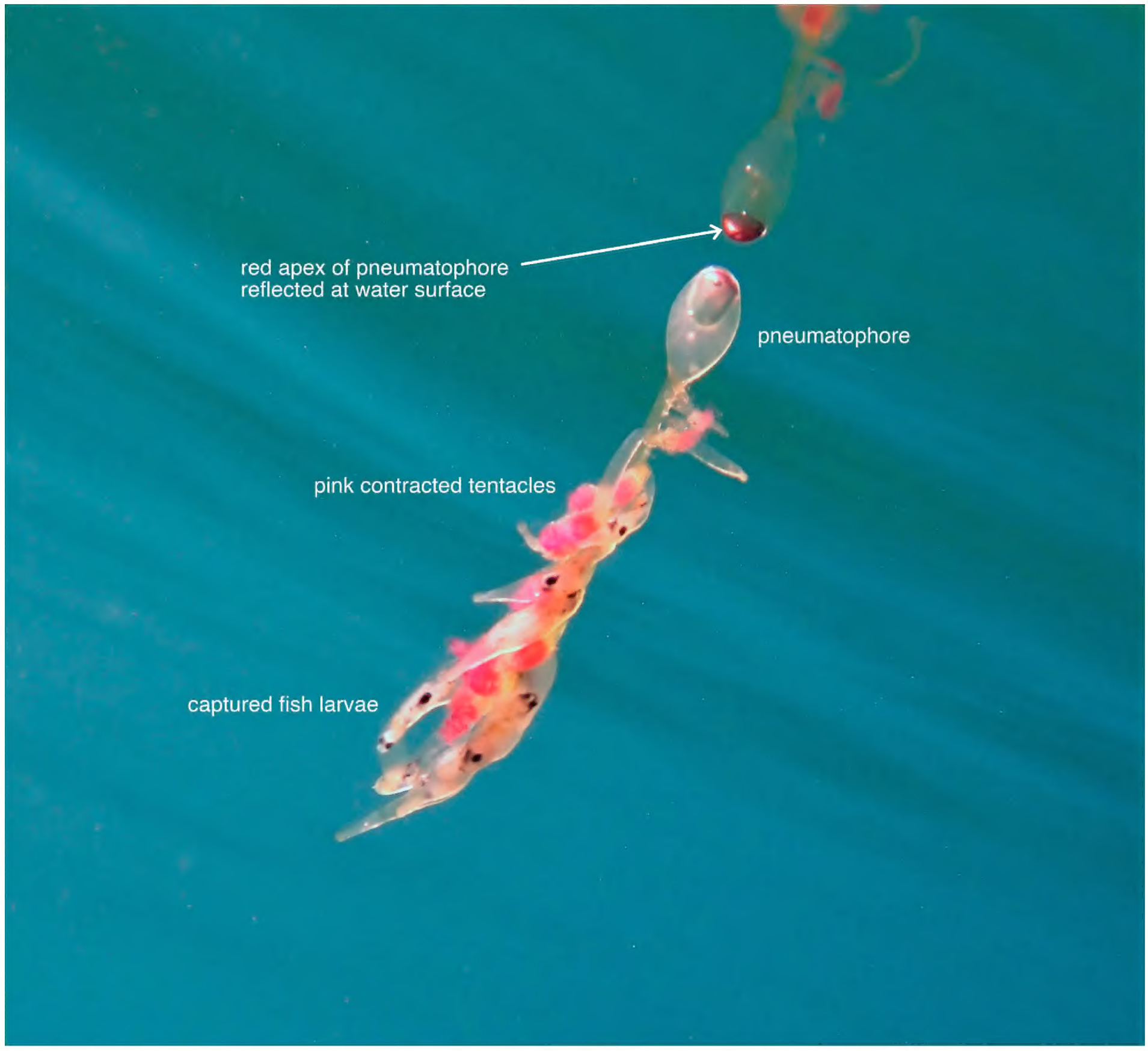

Figure 2. *R. eysenhardtii* smaller specimen near water surface with several captured fish larvae. Picture Catherine Corder.

The pneumatophore of rhizophysids is relatively larger than that of physonect siphonophores and, in the present specimens, a prominent gas bladder or pneumatosaccus, is identifiable, surrounded by a hypocystic cavity confluent with the gastrovascular cavity of the stem. Hypocystic villi arise from the base of the pneumatosaccus and contain gas-producing cells which secrete carbon monoxide into the gas bladder. The latter is lined with a layer of chitin which prevents the gas escaping, except via an apical pore that is controlled by a sphincter muscle (Pugh 2019). A good figure of a section through a rhizophysid pneumatophore is given by Chun (1897) for *R. filiformis* and the pneumatophore of a small specimen of *R. eysenhardtii* is well illustrated by Pagès and Gili (1992, fig. 2). Pugh (2019) notes that the pneumatophore of *R. eysenhardtii* tends to be larger than that of *R. filiformis* and the number and size of the hypocystic villi increase with age. Pneumatophores of the *Rhizophysa* specimens described by Totton (1965) were 12 mm in length for *R. filiformis* and < 18 mm long for *R. eysenhardtii* and the estimate of the pneumatophore of the present specimens falls within this range.

Furthermore, the colouring of the specimens in this study agrees with that described by Kawamura (1910) and Pugh (2019) for this species. Notable is the red circle of pigment surrounding the apical pore of the pneumatophore (Pugh 2019) and this shows particularly well in the smaller colony of specimen 1 (Fig. 2). The pink tentacles are characteristic of *R. eysenhardtii* (Pugh 2019, p. 75) and are well displayed in both present colonies (Figs 1A, C, 2). In contrast, the tentacles of *R. filiformis* are, in general, greenish (Pugh 2019).

A single gonodendron occurs between two gastrozooids in the larger specimen and gonodendra increase considerably in size as they mature towards the posterior end of the specimen, although none is evident in the last three cormidia of the present large specimen (Fig. 1). Pugh (2019) comments that in some specimens there may be two gonodendra per cormidium, but this was not found in the present larger specimens. Perhaps they are released once mature, as has been described for *Bathyphysa sibogae* by Dunn and Wagner (2006).

Rhizophysa eysenhardtii has been shown by Purcell (1981a, b, 1985) to feed almost exclusively on fish larvae. Our observations confirmed that a main source of prey are fish larvae, although one colony had also captured a chaetognath with one of its tentacles. We counted the ingested fish larvae by visual inspection of single to multiple images per colony for the presence of pairs of eyes in the gastrozooids. With this method, we would miss any other ingested prey, such as arrow worms (chaetognaths) that do not have prominent large eyes. Haddock and Dunn (2015) have found that prey of *R. eysenhardtii* is attracted to the colony by a strip of green fluorescence along the length of each gastrozooid, as well shown in their fig. 6B. Such prey attraction is also well demonstrated in fluorescent lures on the tentilla of all five species of the physonect genus *Erenna*, whose diet also comprises exclusively fish (Pugh and Haddock 2016). This finding, therefore, is added evidence for the use of fluorescent lures to attract fish prey in some siphonophores.

Northern and southern limits for published records of *Rhizophysa eysenhardtii* in the three oceans range from Bermuda (32°19'59"N) in the North Atlantic (Fewkes 1883) to previously 'slightly SW of Hondeklip Bay' (31°01'S), South Africa (Pagès and Gili 1992). This record is now extended to False Bay, South Africa. In the Pacific, the species ranges from 35°07'N off Misaki, Japan (Kawamura 1910, 1954) to 23°06'S Mejiliones Bay, Chile (Palma and Apablaza 2004) and in the Indian Ocean from 18°N to 32°S (Daniel 1985, maps 3-4). These illustrate that *R. eysenhardtii* has a relatively warm water distribution, but there are no records of this species from the Mediterranean. In contrast, *R. filiformis* has been recorded in both warm and temperate regions (Pagès and Gili 1992) and recently also from the Mediterranean (Pastor-Prieto et al. 2024). From worldwide records, it does appear that *R. eysenhardtii* can be found at a range of depths, from shallow waters at or near the surface (Daniel and Daniel 1963; Purcell 1981a, b; Pagès and Gili 1991; Palma and Apablaza 2004; Dunn et al. 2005; Dunn and Wagner 2006) to deep water from 1901 m, 1886 m and 701 m (Lens and van Riemsdijk 1908).

The *Rhizophysa eysenhardtii* specimens from False Bay presented in this study are the first records of this species in the Bay. This is a considerable range extension record and about 450 km further south than the only previously reported distribution of *Rhizophysa eysenhardtii* southwest of Hondeklip Bay on the west coast of South Africa. As discussed by Mapstone et al. (2022) for the prayid siphonophore *Lilyopsis*, it seems likely that *Rhizophysa eysenhardtii* may have

arrived in False Bay via the variability of the Agulhas Current at Cape Hangklip during the winter and spring of 2022. Although its congeneric species *R. filiformis* has been sequenced by Munro et al (2018), so far *R. eysenhardtii* has not.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

JL provided the observational records. Both authors conceived the idea for the manuscript. GMM wrote the initial draft. JL provided the figures. Both authors edited the final versions.

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Data availability

All of the data that support the findings of this study are available in the main text.

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